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Science and Technology for Tomorrow's Air and Space Force

Success Story

CORTM PROCESS REDUCES FABRICATION AND ASSEMBLY COSTS FOR COMPOSITE STRUCTURES



The cocuring of the substructure and skin by means of the Cocuring of an uncured skin to a Resin Transfer Molded (CoRTM) process is an effective way to reduce the cost of composite fabrication and assembly. The CoRTM process reduces part count, tool count, weight, and cost. The dimensional precision and repeatability of the resin transfer molding process also enables the use of Z-reinforcement technologies such as Z-pins and three-dimensional preforms, increasing the potential applications by enhancing structural performance.



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Accomplishment

The Composites Affordability Initiative (CAI) Team, consisting of the Materials and Manufacturing Directorate, the Air Vehicles Directorate, the Office of Naval Research, Boeing, Lockheed Martin, and Northrop Grumman, demonstrated a process that can dramatically reduce the costs of composite fabrication and assembly. The CoRTM process, developed by Northrop Grumman, produces large, integrated, weight-efficient, precise, and repeatable structures.

The CAI Team used a vertical stabilizer from the Joint Strike Fighter (JSF) to demonstrate the technology. Using CoRTM to manufacture that part could lead to nearly \$14,000 in savings derived through a 52% reduction in part count, a 38% reduction in tool count, a 7% reduction in weight, and a 17% overall cost reduction when compared to the typical JSF construction process and the associated fit-up, liquid shimming, and surface mold line treatments for air vehicles.

Background

Traditional aircraft structures consist of multiple piece assemblies that manufacturers pre-fit together, filling gaps between mating surfaces with shim materials to create a snug fit, and then mechanically fastening in place. This results in very lengthy manufacturing flow times and high acquisition costs.

Through CAI, the CoRTM process is a viable and promising alternative for affordable composite structures. CoRTM combines two cost-effective processes: fiber placement (the automated placement of bands of high-strength fibers combined with resin onto a tool) for skin structures, currently used on JSF, F-18, V-22, F-22, etc.; and resin transfer molding (the injection of high-strength resin into a mold containing high-strength fibers formed to a specified shape) for substructures currently used on the F-22 Raptor and other aircraft.

Instead of fastening the skin to the substructure, the CoRTM process designs and fabricates the skin and the substructure as a single component, eliminating the need to fasten them together. After the fiber placement process lays up the uncured skin, the manufacturer builds up the substructure by placing and tooling dry fiber preforms on top of the uncured skins. The manufacturer then injects the preforms with resin and cures the whole assembly to form the structure.

For more information on CoRTM or the CAI, call the Technology Information Center at (937) 255-4689. Refer to item number 02-068.

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (03-ML-02)